

Research Article**Comparison of trans-radial and trans-femoral access for coronary angiography
in terms of fluoroscopy time and procedure time****¹Summayia Aslam, ²Iqra Javaid, ³Muhammad Tufail
and ⁴Muhammad Ahsan**¹Medical officer, Basic Health Unit, Chiniot, Punjab, Pakistan
Email: sumayya.aslam311@yahoo.com²Medical officer, Basic Health Unit, Chiniot, Punjab, Pakistan
Email: iqrajavid300@yahoo.com³Medical officer, Rural Health Center, Jhang, Punjab, Pakistan
⁴Medical officer, Allied hospital Faisalabad.Corresponding Author: email: ahsanjahangir194@gmail.com
Tel: +92-3336732138, +92-3236006138**ABSTRACT**

Coronary heart disease takes a long time to develop before the appearance of symptoms. Angioplasty (percutaneous coronary intervention PCI) is a therapeutic procedure in which the clogged arteries are opened up with the help of a balloon catheter. Stents are placed during the angioplasty so that the arteries will remain open after deflating the balloon. Stents can be metallic or they may contain some medicated material.

Objective: To compare the trans-radial and trans-femoral access of coronary angiography in terms of fluoroscopy time, procedure time and dose of contrast agent.

Study Design: Comparative cross sectional study

Settings: Faisalabad Institute of Cardiology, Faisalabad

Duration of Study: January 2017 to January 2018

Subjects & Methods: A total of 200 Patients were divided into two transradial (TR) and transfemoral (TF) groups. Each group contains one hundred patients. Complete physical and clinical examination i.e. oxygen saturation, heart rate and blood pressure of every patient was done before the start of procedure. Patients with bifurcation lesion, chronic renal disease, right heart catheterization chronic total obstruction and bypass graft intervention were excluded. Contrast agent was delivered by the use of 5f sheath. All the variables i.e. contrast dose, fluoroscopy time and procedure time were noted during the whole procedure. Descriptive data was compared by applying Student T test and Chi-square test was applied on nominal data. Data was analyzed using SPSS v.23 and value of $p \leq 0.05$ was considered statistically significant.

Results: Time of complete procedure, fluoroscopy time and contrast dose were 41.92 ± 3.58 min, 12.43 ± 2.34 min and 118.44 ± 3.31 ml in TF Group while 35.19 ± 3.67 min, 8.79 ± 1.93 min and 113.27 ± 3.59 ml in the TR Group; and these differences were statistically significant ($p < 0.001$ for all).

Conclusion: Coronary angiography done through the trans-radial approach is more favorable to the patients of coronary heart disease as compared to the coronary angiography done through trans-femoral approach.

Keyword: Coronary angiography, trans-radial approach, trans-femoral approach, procedure time, fluoroscopy time

INTRODUCTION:

One of the major reasons for morbidity and mortality all over the world is coronary heart disease. Coronary arteries are the blood vessels

which supply blood, nutrients and oxygen to the muscles of the heart and a constant flow of blood ensures the optimal functioning of the heart.[1] In

coronary artery disease there is reduction in blood flow to the heart muscles and as a result of this reduced flow heart muscles do not get enough oxygen to perform their function optimally. [2] Many factors are involved in the development of the coronary heart disease but the most important factor is atherosclerosis. [3] Atherosclerosis occurs as a result of injury to the blood vessel and as a result of the injury cholesterol starts to deposit in the injury site and over a period of time it forms plaques in the wall of the artery. [4] As a result of this plaque formation the diameter of the arteries becomes narrow and the blood flow to the heart muscles is decreased. The disease manifests itself in the form of shortness of breath, Angina (chest pain) and even heart attack. There are many risk factors in the formation of coronary heart disease i.e. age, sex, family history, high cholesterol level, obesity, diabetes, physical inactivity, smoking and hypertension. [5]

Coronary heart disease takes a long time to develop before the appearance of symptoms. To diagnose the disease before the manifestation of symptoms different techniques are used like chest X-ray, ECG, blood tests, stress testing, echocardiography, cardiac catheterization and coronary angiography. [6] Coronary angiography is a procedure in which special X-rays are used to see the vessels of the heart. [7] A contrast dye is first inserted into the arteries of the heart through a flexible catheter and x-rays are taken before and after injecting the dye and the angiogram is shown on the computer screen which shows the condition of the vessel walls. To inject the dye into the coronary arteries two commonly used peripheral arteries are radial artery and femoral artery. [8] There are many risk factors associated with the coronary angiography like heart attack, radiation exposure, irregular heart rhythms, infection, allergic reaction to the dye, stroke, injury to the artery and excessive bleeding. [9]

Angioplasty (percutaneous coronary intervention PCI) is a therapeutic procedure in which the clogged arteries are opened up with the help of a balloon catheter. [10] Stents are placed during the

angioplasty so that the arteries will remain open after deflating the balloon. Stents can be metallic or they may contain some medicated material. Angioplasty is used as a mean to avoid coronary artery bypass graft.

For a long time Trans femoral route was the only route used for coronary angiography because of the larger diameter of common femoral artery. Local anesthetics are used during this procedure. Common complications associated with trans-femoral angiography are pulmonary embolism, AV fistula formation and false aneurysm formation. Now radial artery is used to perform coronary angiography as there are fewer complications and recovery time is less for the Trans radial angiography. Trans-radial approach requires more time and more expertise when compared with the Trans femoral approach. Fluoroscopy time is the time during which body remains exposed to the radiation. In this study we are going to compare the difference in contrast dose and fluoroscopy time between trans-radial and trans-femoral approaches of coronary angiography.

MATERIAL & METHODS:

This study was a randomized control trial. Study was performed in Faisalabad Institute of Cardiology, Faisalabad from January 2017 to January 2018. Ethical approval was obtained from hospital ethics committee. Informed consent was taken from the patients prior to the inclusion into this study. Sample size was calculated from the reference study performed by Ikhtlaq H et al. Non probability consecutive sampling technique was used to collect the sample size. Patients undergoing coronary angiography only or patients with no complications during the trans-radial and trans-femoral access became part of this study. Patients with bifurcation lesion, chronic renal disease, right heart catheterization chronic total obstruction and bypass graft intervention were excluded from the study.

Total of two hundred patients were selected for the study. Patients were divided into two trans-

radial (TR) and trans-femoral (TF) groups. Each group contains one hundred patients. Complete physical and clinical examination i.e. oxygen saturation, heart rate and blood pressure of every patient was done before the start of procedure. Patients were selected for the TF or TR group randomly and on the basis of the expertise of the surgeon. For the prevention of radial artery spasm all the patients undergoing TR approach were treated with isosorbidedinitrate before the start of angiography. The problem of thrombosis was controlled by the use of unfractionated heparin. Contrast agent was delivered by the use of 5f sheath and assessment of coronary vessels was made before completing the procedure. All the variables i.e. contrast dose, fluoroscopy time and procedure time were noted during the whole procedure. Contrast dose is defined as the quantity of contrast agent which was utilized during the angiography. Procedure time is the duration of time required for the completion of procedure i.e. from entry to catheterization lab to the end of operation. Fluoroscopy time is the time during

which body remains expose to the radiation. Descriptive data was compared by applying Student T test and Chi-square test was applied on nominal data. Computer software SPSS version 23 was used to statistically analyze the data. P value of less than or equal to 0.05 was taken as significant.

RESULTS:

We divided two hundred patients into two equal groups, TF-Group and TR-Group. Age, body mass index and male to female ratio was 56.81±9.21 years, 29.58±4.36 Kg/m² and 77/23 in the TF Group where 57.69±8.08 years, 29.08±4.09 Kg/m² and 78/22 in the TR Group. There were no statistically significant differences (p-value 0.463, 0.866 and 0.405, respectively). Time of complete procedure, fluoroscopy time and contrast dose were 41.92±3.58 min, 12.43±2.34 min and 118.44±3.31 ml in TF Group while 35.19±3.67 min, 8.79±1.93 min and 113.27±3.59 ml in the TR Group; and these differences were statistically significant (p<0.001 for all)[Table-I].

Table-I: Comparison of Baseline Data and Procedural Details between the Groups

Variable	TF Group (n=100)	TR Group (n=100)	P value
Age, years	56.81±9.21	57.69±8.08	0.463
Gender, M/F	77/23	78/22	0.866
BMI, Kg/m²	29.58±4.36	29.08±4.09	0.405
Procedural Time, min	41.92±3.58	35.19±3.67	<0.001
Fluoroscopy Time, min	12.43±2.34	8.79±1.93	<0.001
Contrast Dose, ml	118.44±3.31	113.27±3.59	<0.001

Data is entered as mean ± S.D or ratio; BMI = body mass index

(Note: chi-square test for gender, student t-test for all other variables. Our calculated sample size from the reference study was less than 30, so we chose to enroll 200 patients in our study.)

DISCUSSION:

In our study we deduced that the coronary angiography done through the trans-radial approach is more beneficial to the patients of coronary heart disease as compared to the coronary angiography done through trans-femoral approach. In trans-radial approach there is less fluoroscopy time and procedure time. Dose of contrast agents is more in

trans-femoral approach in terms of trans-radial approach. Risk of complications is more in trans-femoral way of angiography so keeping in view all of these facts we concluded that the trans-radial approach is more safe for the patients and it is as effective as trans-femoral way of coronary angiography.

Ikhlaq H et al. performed their study on six hundred patients and they came to know that the trans-radial approach of angiography is more beneficial for the patients of coronary heart disease as this approach comes with less exposure to the radiation, less procedure time and with less complications when it is judged against trans-femoral approach of coronary angiography. Yuejin Y et al.[11] conducted a study on eight hundred and twenty one patients of coronary heart disease patients and they done the revascularization procedure through the trans-femoral and trans-radial route and came to the conclusion that the patients in the trans-femoral group experienced more complications and no significant benefits over trans-radial approach so they said that the trans-radial approach is more efficient and safe for the patients with coronary heart disease. Christopher R et al. [12] compared the trans-radial approach with trans-femoral approach in terms of its feasibility and lower risk of complication with trans-femoral way of angiography. They included the four hundred and two coronary angiographies in their study and they saw that the patients with trans-radial access require less contrast dose, fluoroscopy time and procedure time so they inferred that the doctors should learn trans-radial approach as this is safe and as effective as the trans-femoral angiography. Kefei D et al. [13] compared the difference of two approaches in the patients with triple vessel coronary disease. They included four thousand nine hundred and seventy four patients of triple vessel disease in their study and they saw that here is no significant difference in procedure time between two approaches however the death rate, duration of clinic stay and complication are more in the trans-femoral group when compared with trans-radial group with no superiority in terms of efficacy. Trevor S et al. [14] compared the radiation exposure between the trans-femoral and trans-radial coronary angiography and they saw that there is little increase in the radiation exposure during trans-radial way of angiography but as the operator is becoming experienced over time this increase in radiation

exposure become less and less and ultimately become equal to the trans-femoral way of coronary angiography.

Carlos C et al. [15] conducted a study on the patients of ST elevated myocardial infarction and they compared the two approaches of percutaneous coronary intervention and they came to know that the trans-radial approach is linked with less bleeding and in turn favors a better outcome in terms of trans-femoral approach. Tesfeldet T et al. [16] done a study on the patients with bypass graft surgery and they came to the conclusion that the trans-femoral approach is better for the patients with previous CABG surgery as it is associated with less operation time, radiation dose and other complications like bleeding is also lower as compared to the trans-radial approach. Amit N et al.[17] conducted their study and they conclude that the trans-femoral access is associated with more adverse outcomes like bleeding, longer hospital stay when we saw this in terms of trans-radial access of coronary angiography. John F et al. 18 in their study established that there is less complication in trans-radial approach of coronary angiography than the traditional femoral approach. Young J et al. [19] did a study on Korean people and their results are similar like our study.

CONCLUSION:

Coronary angiography done through the trans-radial approach is more favorable to the patients of coronary heart disease as compared to the coronary angiography done through trans-femoral approach. There is decrease rate of complication, radiation exposure; procedure time and patient recover faster when trans-radial approach is used.

CONFLICT OF INTEREST: Nil

REFERENCES:

1. Holzapfel GA, Ogden RW, editors. Biomechanics of soft tissue in cardiovascular systems. Springer; 2014

2. Ghattas A, Griffiths HR, Devitt A, Lip GY, Shantsila E. Monocytes in coronary artery disease and atherosclerosis: where are we now?. *J Am CollCardiol.* 2013;62(17):1541-51.
3. Nordestgaard BG, Chapman MJ, Humphries SE, Ginsberg HN, Masana L, Descamps OS, et al. Familial hypercholesterolaemia is underdiagnosed and undertreated in the general population: guidance for clinicians to prevent coronary heart disease: consensus statement of the European Atherosclerosis Society. *Eur Heart J.* 2013;34(45):3478-90.
4. Shrivastava AK, Singh HV, Raizada A, Singh SK. C-reactive protein, inflammation and coronary heart disease. *Egypt Heart J.* 2015;67(2):89-97.
5. Chow CK, Redfern J, Hillis GS, Thakkar J, Santo K, Hackett ML, et al. Effect of lifestyle-focused text messaging on risk factor modification in patients with coronary heart disease: a randomized clinical trial. *Jama.* 2015;314:1255-63.
6. Nørgaard BL, Leipsic J, Gaur S, Seneviratne S, Ko BS, Ito H, et al. Diagnostic performance of noninvasive fractional flow reserve derived from coronary computed tomography angiography in suspected coronary artery disease: the NXT trial (Analysis of Coronary Blood Flow Using CT Angiography: Next Steps). *J Am CollCardiol.* 2014;63(12):1145-55.
7. Scheske JA, O'Brien JM, Earls JP, Min JK, LaBounty TM, Cury RC, et al. Coronary artery imaging with single-source rapid kilovolt peak-switching dual-energy CT. *Radiology.* 2013;268(3):702-9.
8. Mullin MK. Trans-radial approach versus trans-femoral approach for coronary angiography and coronary angioplasty. *Crit care Nurs quart.* 2014;37(2):159-69.
9. Andreucci M, Solomon R, Tasanarong A. Side effects of radiographic contrast media: pathogenesis, risk factors, and prevention. *BioMed res Int.* 2014;2014.
10. JCS Joint Working Group. Guidelines for elective percutaneous coronary intervention in patients with stable coronary artery disease (JCS 2011) published in 2012. *Circ J.* 2013;77(6):1590-607.
11. Yang YJ, Kandzari DE, Gao Z, Xu B, Chen JL, Qiao SB, et al. Trans-radial versus trans-femoral method of percutaneous coronary revascularization for unprotected left main coronary artery disease: comparison of procedural and late-term outcomes. *JACC: Cardiovasc Inter.* 2010 ;3(10):1035-42.
12. Balwanz CR, Javed U, Singh GD, Armstrong EJ, Southard JA, Wong GB, et al. Trans-radial and trans-femoral coronary angiography and interventions: 1-year outcomes after initiating the trans-radial approach in a cardiology training program. *Am heart J.* 2013;165(3):310-6.
13. Dou K, Xu B, Yang Y, Chen J, Qiao S, Wang Y, Li J, et al. Comparison of procedural and long-term outcomes between trans-radial and trans-femoral approach in one-stage intervention for triple vessel coronary artery disease. *J IntervCardiol* 2014;27(2):108-16.
14. Simard T, Hibbert B, Natarajan MK, Mercuri M, Hetherington SL, Wright R, et al. Impact of center experience on patient radiation exposure during trans-radial coronary angiography and percutaneous intervention: a patient-level, international, collaborative, multi-center analysis. *J Am Heart Assoc* 2016 ;5(6):e003333.
15. Cafri C, Zahger D, Merkin M, Weinstein JM, Kobal S, Ilia R. Efficacy of the radial approach for the performance of primary PCI for STEMI. *J Invasive Cardiol.* 2013;25(3):150-3.
16. Michael TT, Alomar M, Papayannis A, Mogabgab O, Patel VG, et al. A randomized comparison of the trans-radial and trans-femoral approaches for coronary artery bypass graft angiography and intervention: the RADIAL-CABG Trial (RADIAL Versus Femoral Access for Coronary Artery Bypass

- Graft Angiography and Intervention). *JACC: Cardiovasc Inter.* 2013;6(11):1138-44.
17. Vora AN, Rao SV. Bleeding complications after PCI and the role of trans-radial access. *Curr treat option in cardiovas med.* 2014;16(5):305
 18. Wagener JF, Rao SV. A comparison of radial and femoral access for cardiac catheterization. *Trends Cardiovas Med.* 2015 ;25(8):707-13.
 19. Youn YJ, Lee JW, Ahn SG, Lee SH, Yoon J, Cho BR, et al. Current practice of trans-radial coronary angiography and intervention: results from the Korean trans-radial intervention prospective registry. *Korean Circ J.* 2015 ;45(6):457-68.